STATUS AND POST SUPPRESSION EVALUATION OF BALSAM WOOLLY APHID INFESTATIONS ON ROAN MOUNTAIN, TOECANE RANGER DISTRICT, PISGAH NATIONAL FOREST, N.C.

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ABSTRACT

The balsam woolly aphid (Adelges picea Ratz.) continues to cause extensive damage to Fraser fir (Abies fraseri [Pursh] Poir.) on Roan Mountain in the unprotected areas of the 900 acres of mixed spruce-fir forest. During the summer and fall of 1981, a regular, annual evaluation survey was conducted to evaluate the effectiveness of the chemical control program. Data taken from established, permanent plots within the protected 440 acres indicate that control was effective. Therefore, continuation of the control project is recommended for 1982.

INTRODUCTION

Roan Mountain, located on the border between Tennessee and North Carolina, is managed by the Toecane Ranger District, Pisgah National Forest. It is a popular recreation area with numerous attractions, including the alpine-type spruce-fir setting, the Appalachian Trail, Rhododendron Gardens, and Roan High Bluff Overlook.

In 1962, the first balsam woolly aphid (BWA) infestation on Roan Mountain was detected, and the insect has since spread rapidly throughout the 900 acres of mixed spruce-fir forest. From 1971 through 1980, the Toecane Ranger District and Forest Pest Management designated three areas for protection against the BWA through chemical application for control. These areas were based on accessibility, intensity of visitor use, and visibility to the public. A protection boundary of 200 feet on either side of the roads and trails in each area and the entire Rhododendron Gardens were sprayed. In 1979 and 1980, the post control evaluation showed that the spray program was not providing protection for the three year period; therefore, in 1981 the recommendation was changed to a two year program, and one-half of the area was sprayed in FY 81, which included State Highway #1348, Parking Area #1, the Old Hotel Site, the Toll House Picnic Area, Carvers Gap Picnic Area, and the Appalachian Trail Zone from Carvers Gap to Toll House Gap (Area B). Areas A and B are to be sprayed in alternate years.

The spray program also provides a protected source for seed collection. This and a few other small private ownerships are the only known protected areas where Fraser fir seed can be collected.

The protection areas and control schedules for 1982 and 1983 are as follows (for location, see Fig. 1):

Area A - 1982

Forest Service Road #130	50 ac
Roan High Bluff Trail	20 ac
Balsam Road Buffer (FS Road #130-A) and Rhododendron Gardens	140 ac
TOTAL	210 ac

Area B - 1983

State Highway #1348 Zone, Parking Area #1, Old Hotel Site and Toll House Picnic Area	120 ac
Carvers Gap Picnic Area, Appalachian Trail Zone from Carvers Gap to Toll House Gap	110 ac
TOTAL	230 ac

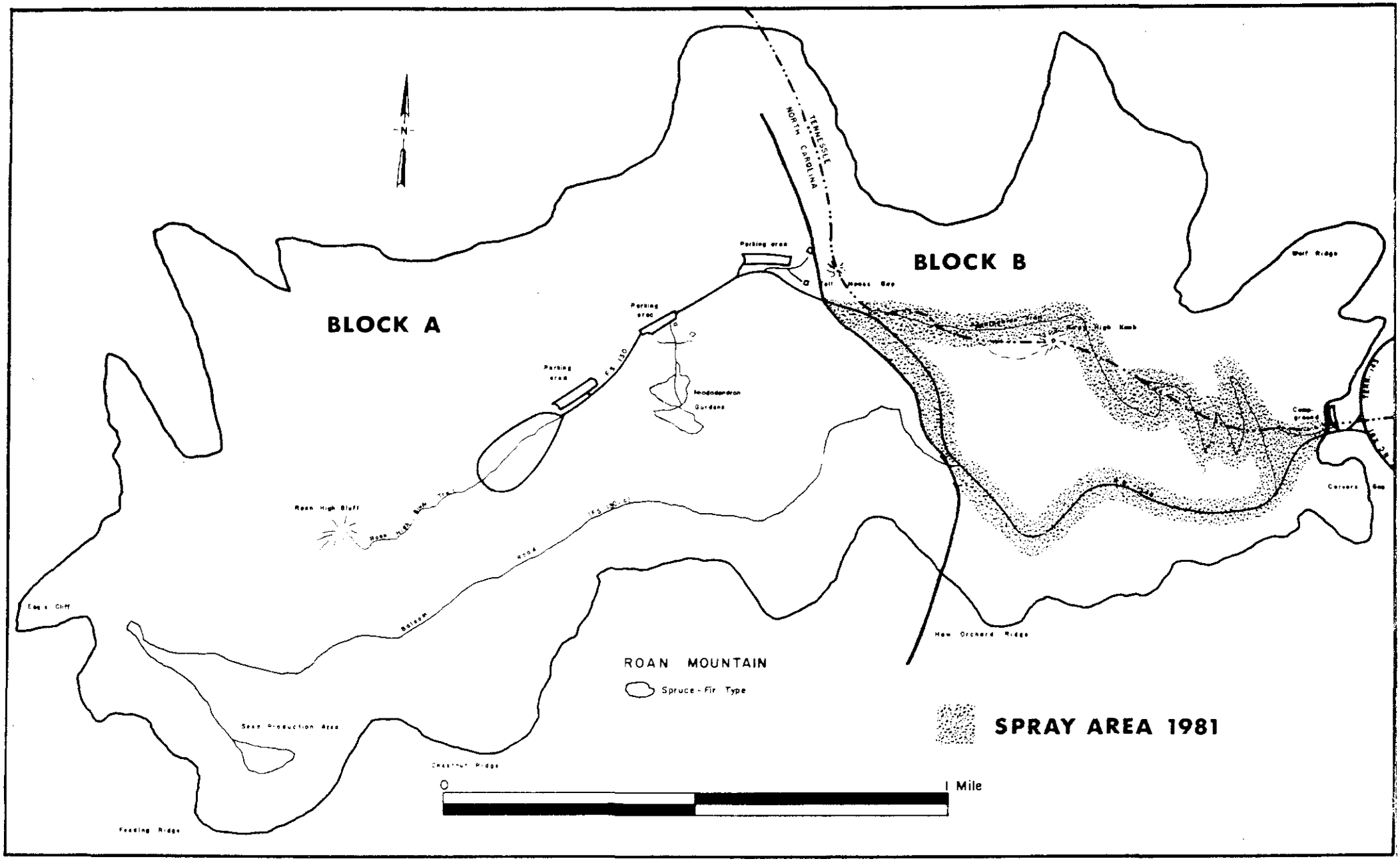
The purpose of this evaluation survey was to determine the level of BWA infestation in each area and to assess the effectiveness of the control program.

METHODS

Ground examinations were made within the boundaries of the two protection areas to determine the status of the aphid and the effectiveness of the 1981 spray program. The protection areas were: Forest Service Road #130, Roan High Bluff Trail, Balsam Road Buffer (FS Road #130-A), and Rhododendron Gardens (Area A); State Highway #1348 Buffer Zone, Parking Area #1, Old Hotel Site, Toll House Picnic Area, Gap Picnic Area, and Appalachian Trail Zone from Carvers Gap to Toll House Gap (Area B).

Twenty-two plots were established in Area A and 20 in Area B to collect the necessary data for this evaluation (Fig. 1). The plots are one-tenth acre, fixed, circular plots established 1, 2, or 3 chains into the woods from the roads and trails at approximately one-fifth mile intervals. Conspicuous landmarks were used to mark entry points and were accompanied by azimuth direction. The plot center was indicated by a metal stake labeled with the plot number. Within each plot, up to 16 sample trees were selected and their positions and diameters recorded on a diagram. Each sample tree was carefully examined with a 10x flashlight magnifier on the lower five feet of the tree's main stem. The presence of any of the life stages of the aphid was recorded, along with tree number, the azimuth direction, and distance of the sample tree from plot center.

Figure 1.--Map of Roan Mountain showing the spray areas (Area A and Area B) and the area sprayed in 1981.



TECHNICAL INFORMATION

Insect: The balsam woolly aphid was introduced to North America from Europe around 1900 and was first discovered in the southern Appalachians in 1957. Balsam woolly aphids reproduce by parthenogenesis, with each female producing an average of 100 eggs. The functional life cycle consists of an egg stage, three nymphal instars, and the adult. During the first nymphal stage, the insect is motile and can be dispersed over large areas by wind currents. The adult is stationary and covered with curling, waxy threads--the characteristic protective "wool." The insect overwinters as a dormant nymph, and during North Carolina summers, there may be three to four generations.

Hosts: Balsam woolly aphids infest only true firs--members of the genus Abies. Its hosts in the southeastern United States are Fraser fir and bracted balsam fir (Abies balsamea var. phanerolepsis Fern.).

Damage: Balsam woolly aphid infestations are classed as either "crown" or "stem" attack. Bracted balsam fir is more likely to suffer crown infestations, which are less severe; twig gouting and top dieback results, but trees often recover. The stem infestations suffered by Fraser fir usually kill the host within 2 to 6 years. Mortality is attributed to a salivary substance injected during BWA feeding, which causes abnormal cell production and consequent interference with fluid translocation in the tree. This abnormal cell production is commonly referred to as red-wood. The red-wood resembles compression wood on the uphill side of most conifers growing on a steep slope.

Control: Chemical control procedures consist of the application of one-eighth percent Lindane water solution along the entire bole and limbs of each tree to the point of runoff using a hydraulic sprayer.

RESULTS

The results of the 1981-82 status survey and post suppression evaluation are given in Tables 1 and 2. Data in Table 2 indicate that the 1981 spray program was 66 percent successful in reducing the number of infested trees, 97 percent successful in the reduction of live eggs, and 43 percent successful in the reduction of live aphids.

DISCUSSION

The results of this survey of Roan Mounain indicate that the chemical control procedures have been effective. As shown in Table 2, the reduction of the life stages and the number of infested trees shows success in reducing the aphid population present in the spray area. Tables 1 and 2 also show the success of preventing the spread of the aphid into the protection boundary of the current spray program.

Forest Pest Management has completed the cruise of Area B, and all known infestations in this area have been mapped. The cruise of Area A will be completed in May of this year, and at that time, all active infestations within the sprayed protection boundary on Roan Mountain will be known and recorded on a map.

Table 1.--Infested trees and percent of infested plots by spray area; survey conducted in March and August 1981.

Area A

1981-82 Survey - Last Treated 1978-79
(Permanent Sample Plots)

	Number of Plots	Total # of Trees	Number of Trees Infested	% Trees Infested	% Plots Infested	Year Treated
Forest Service Road #130	6	83	0	0	0	1979
Roan High Bluff Trail	2	32	0	0	0	1979
Balsam Road (FS #130-A) and Rhododendron Gardens	14	179	22	17	19	1978
TOTAL	22	294	22	17	19	

Area B

1981-82 Survey - Prior to 1981 Treatment
(Permanent Sample Plots)

	Number of Plots	Total # of Trees	Number of Trees Infested	% Trees Infested	% Plots Infested	Year Treated
Hwy #1348, Parking Area #1, Old Hotel Site, Toll House Picnic Area	10	140	0	0	0	1980
Carvers Gap Picnic Area, Appalachian Trail Zone - Carvers Gap to Toll House Gap	10	142	9	6	30	1978
TOTAL	20	182	9	6	30	

Table 2.--Comparison of infested plots by infested trees in Area B before treatment and after treatment.

Area B

Treated September 1981

	Pre Suppression Data (Conducted March & April 1981)			Post Suppression Data (Conducted November 1981)		
Plot #	Infested Tree #	# of Live Eggs	# of Live Aphids	Infested Tree #	# of Live Eggs	# of Live Aphids
X-8	10	15	1	10	1	3
	13	2	0	13	0	0
	14	3	0	14	0	0
	15	8	5	15	1	3
	16	20	8	16	0	4
X-6	2	2	1	2	0	0
	13	8	0	13	0	0
	14	3	0	14	0	0
X-5	2	3	0	2	0	0
TOTAL	9	64	15	4	2	10

Control is again recommended for 1982 on Roan Mountain. There are two basic options for management of the spruce-fir forests on Roan Mountain infested by BWA:

1. Gradual conversion to pure red spruce.
2. Chemical control.

RECOMMENDATIONS

It is recommended that;

1. a control project be continued for BWA on Roan Mountain, and

2. treatments should include silvicultural management and removal of infested trees, and applying a one-eighth percent solution of Lindane in water with a hydraulic sprayer to the trunk and branches of the trees to the point of runoff.

The proposed FY 1982 control program is the treatment of Area A (Fig.1)--approximately 210 acres.

PRECAUTIONARY PESTICIDE USE STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key--out of the reach of children and animals--away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honeybees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment, if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump or crush and burn them in a level, isolated place.

Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agricultural agent or state extension specialist to be sure intended use is still registered.

Before using any pesticide, read the label carefully.

REFERENCES

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